[U.S. Geological Survey New York Water Science Center – http://ny.usgs.gov](http://ny.usgs.gov)

Message from Rafael W. Rodriguez, Director, New York Water Science Center

The U.S. Geological Survey (USGS) New York Water Science Center (NY WSC) has recently revised its web pages. Most prominent on the home page you will find a map of the current real-time streamflow conditions. These maps on the home page will be changed periodically depending on the hydrologic conditions and may reflect streams that are above flood stage as you will always find on the floodwatch page or below normal 7- 14- or 28-day average streamflow as you will find on the droughtwatch page. The new web pages include links across the top to data, projects, and publications as well as the droughtwatch and floodwatch pages. Along the side you'll see links to real time or historic data. There are also featured projects, recent publications, and USGS news items from NY and around the country – even pod casts. The goal was to make it easier for you to find what you are looking for; we hope we have succeeded. There is a tremendous amount of information, please take a moment to visit our new pages at http://ny.usgs.gov and let us know what you think.

As always, I am interested in hearing from you. Please feel free to contact me about this or any other issues or program opportunities you may wish to discuss. I can be reached at (518) 285-5659 or rrodrigu@usgs.gov.

Selected Projects – For information on all our active projects, visit our project summary web page. For more information on the specific project, please click on the project title.

Measuring Bi-Directional Flow from Onondaga Lake; part of the USGS surface-water monitoring network in New York

The surface-water monitoring network in New York includes over 300 sites funded by various Federal, State, County, and local agencies. These sites include about 250 streamflow monitoring sites and the remainder of the sites monitor stream, lake and reservoir, or tide stage (water-surface elevation). The NY WSC staff use hydroacoustic methods to make field measurements at a large percentage of the streamflow monitoring sites. At twelve sites where more complicated flow patterns or tidal conditions exist, the USGS mounts Acoustic Doppler Velocity meters in the stream channel to monitor the water's velocity and to compute streamflow. These instruments use sound waves to measure both the velocity and direction of flow throughout the water column or cross section where the meter is located. For more information visit the USGS Hydroacoustics web page.

The Onondaga County Department of Water Environment Protection and the Onondaga Lake Partnership need to know the relationship between the flow of water (or discharge), leaving Onondaga Lake from its 285 square-mile watershed and the possibility of water from the Seneca River entering Onondaga Lake. This is a complex flow system and a perfect application for hydroacoustics. The discharge of water from/to Onondaga Lake was poorly understood and thought to be bi-directional due to water-quality differences between Onondaga Lake and the Seneca River.

Figure 1. – Aerial photo of the Onondaga Lake Outlet as it flows from/to the Seneca River and the four USGS gages used to monitor flow in these channels.

Water level and discharge in the Seneca River is controlled by the operation of the New York State Barge Canal system, along with hydroelectric power generation at Barge Canal dams, and natural variation in flow from the watershed. Understanding the discharge interactions in the Outlet Channel for Onondaga Lake is required for the development of both Seneca River and Onondaga Lake water-quality models, which are designed to help properly manage nutrient inputs to Onondaga Lake from its watershed including the discharge of advanced tertiary treatment effluent from the Syracuse area wastewater treatment plant to Onondaga Lake. Acoustic-velocity meters are being used to determine the amount of discharge and the direction of water flowing in the Outlet Channel of Onondaga Lake.

Three other sites near the junction of the Seneca River at Klein Island (upstream Klein Island (USKL), downstream Klein Island (DSKL), and the Cut Channel on fig. 1) as well as the Outlet of Onondaga Lake are being monitored by the USGS to assist these agencies in meeting their water-quality modeling goals (fig. 1). All four of these sites are funded cooperatively by the Onondaga Environmental Institute and the USGS.

Results to date include the documentation of bidirectional flow, not only in the Outlet Channel of Onondaga Lake, but also in the upstream and downstream channels around Klein Island. The characteristics of water flow at the intersection of the Seneca River and the Outlet Channel of Onondaga Lake resembles complex tidal conditions seen along coastal areas. The volume (discharge) of Seneca River water as well as the flow direction and volume in the Onondaga Lake outlet are dependent on operations of the Barge Canal locks, regulation of discharge from low-head hydroelectric facilities, as well as discharge from Oneida Lake, located further downstream of the Outlet. For more information contact: Hank Zajd (607) 266-0217 ext. 3023 or email hzajd@usgs.gov.

Mercury Cycling and Bioaccumulation in the Upper Hudson River Basin

Mercury contamination of aquatic biota remains a serious problem in New York State waters and throughout the U.S. The most recent 2008-2009 Health Advisory report by the New York State Department of Health titled, "Chemicals in Sportfish and Game" issues a warning for women of child-bearing age, and children, not to eat pickerel, northern pike, smallmouth and largemouth bass, walleye, and large (longer than 10 inches) yellow perch from any waters in the Adirondacks and Catskills. The source of this contamination is believed to be largely from atmospheric deposition of mercury in rain, snow, particles, and gas that originates from upwind sources that are local, regional, and global in scale. Although some mercury is known to originate from natural sources such as volcanoes, most originates from human sources such as coal-fired power plants and cement manufacturing facilities. Evidence from lake sediment cores generally indicates that atmospheric deposition of mercury to New York waters peaked in the 1980s and has been declining since that time, but despite these declines mercury contamination of aquatic biota remains a serious problem.

Mercury is known to magnify (bioconcentrate and bioaccumulate) through the food web so that concentrations in top level predators, such as fish listed in the State consumption advisory, can be a million-fold greater than those from atmospheric deposition. The mercury cycle is also complex, and despite a sharp increase in knowledge about mercury-cycling processes in the past 20 years, much remains to be learned in order to accurately predict the response of mercury in biota to future clean air policies. Specifically, most mercury cycling research in New York

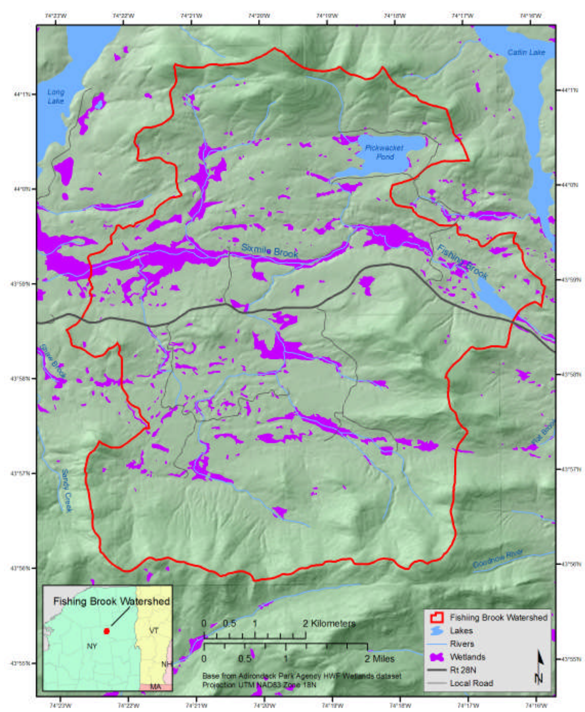

Figure 2, -- Map of Fishing Brook watershed near Newcomb, New York, site of the USGS mercury study. The pink areas show wetlands, which are extensive in Fishing Brook and play an important role in the mercury cycle.

has focused on the response in lakes, whereas fewer studies have focused on mercury cycling and bioaccumulation in flowing waters.

For the reasons described above, the U.S. Geological Survey initiated a study of mercury cycling and bioaccumulation in the Upper Hudson River basin in 2006. This study is part of the USGS National Water Quality Assessment program, and

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also includes a parallel investigation in the Edisto River basin of South Carolina. The specific focus of the study in the Adirondacks is the 25 mi^2 Fishing Brook watershed, which enters the Hudson River at Newcomb (fig. 2). During this investigation, mercury is being measured in stream water, ground water, soils, and in a variety of aquatic biota, including algae, insects, and fish. A specific project focus is the measurement of methylmercury, the form that is magnified in the food web and is toxic to humans and to wildlife. Data collection will continue through 2009, with production of several reports scheduled for 2010-11. Project investigators are also developing computer models of mercury cycling and bioaccumulation at Fishing Brook to aid in better quantitative understanding of the mercury cycle and to help predict likely responses to future air quality policies. Contact: Karen Riva-Murray krmurray@usgs.gov, (518) 285-5617 or Doug Burns daburns@usgs.gov, (518) 285-5662.

Using models to simulate chemical reactions of iron during aquifer storage and recovery

Aquifer storage and recovery (ASR) is a procedure whereby extra water is pumped into an aquifer, stored there, and pumped out at a future date, perhaps during a drought. Extra water typically comes from a different source other than the native water from the storage aquifer, such as a river (fig. 3).

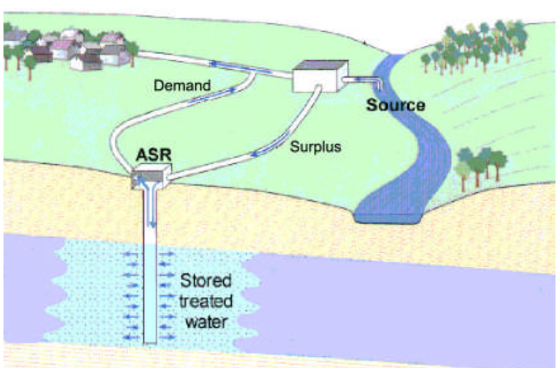

Figure 3. – Schematic of aquifer storage and recovery system.

Some native aquifer waters are very old and deep and have not been in contact with the atmosphere or the oxygen it contains for a long time. These native waters may contain elevated concentrations of dissolved iron. Iron is well known to rust upon contact with rainwater, and a similar chemical reaction takes place when old native aquifer water containing dissolved iron suddenly is mixed with water that is saturated with oxygen from the atmosphere. In this case, the dissolved iron combines with the dissolved oxygen to create the mineral goethite. This reaction has been leveraged by water managers in Switzerland as an in-situ technique for removing dissolved iron by changing it into goethite and leaving it behind in aquifer sediments. Thus, in addition to assisting water managers by providing extra water during shortages, ASR my also assist water managers by providing a means of conditioning native aquifer water.

Unfortunately, when oxygen-rich water is pumped into aquifer sediments that contain the iron-sulfide mineral, pyrite, the beneficial aspects of goethite creation can be adversely affected. This is because as pyrite dissolves, the water becomes acidic, and the goethite reaction is not thermodynamically favored in acidic conditions. The adverse affect of pyrite may be controlled through the use of lime as a buffer that keeps water from turning acidic. The Cretaceous aquifers in Staten Island and Long Island, NY may contain problematic levels of dissolved iron that would benefit from controlled ASR goethite precipitation, but may also contain pyrite. A model was developed to simulate the ASR process. Simulations with greater amounts of pyrite in aquifer sediments resulted in increased acidity during its dissolution, greater concentrations of dissolved iron, and smaller amounts of goethite being created. Furthermore, the concentrations of dissolved iron were greater with successively less liming. The ASR model can be used as a tool to evaluate potential site locations with respect to native-aquifer water quality and mineralogy, to guide liming-plant design, and to evaluate other factors such as monitoring well placement.

For more information contact: Stephen Terraciano (631) 736-0783, saterrac@usgs.gov.

Hydrologic Conditions

Surface Water in New York, February to July 2008

Average streamflow conditions across New York State have increased over the last month as shown in the 45-day graph of index streamflow (fig. 4). Precipitation figures from the NOAA Regional Climate Center show that in the last 6 months New York experienced above-normal precipitation for February, March, and July and well below-normal precipitation in April and May.

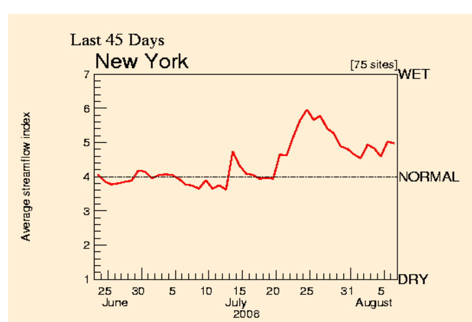

Figure 4. – Graph of index streamflow for NY, June to August 2008, from 75 sites with more than 30 years of record.

The 6-month accumulated precipitation totals indicate New York has had from 2-to-6 inches more rain than normal, and hydrologic conditions are now (early August) in the normal-to-wet range, but it wasn't that way in May and June. Figure 5 shows the monthly-average streamflow conditions where the yellow and red basin shading in May and June indicate that conditions were well below normal.

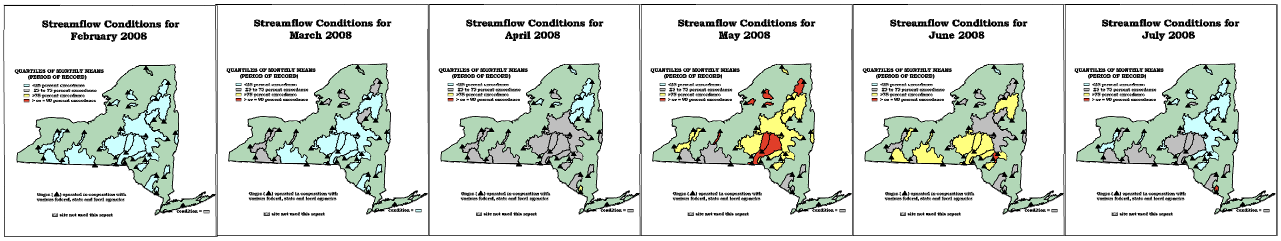

Figure 5. – Average monthly hydrologic conditions from February 2008 (far left) to July 2008 (far right) at selected surface-water sites in New York – where blue indicates wet conditions; gray indicates normal conditions; yellow indicates dry conditions; and red indicates very dry conditions. These maps are contained within the "End-of-Month Hydrologic Conditions" reports available at: http://ny.water.usgs.gov/cgi-bin/eomreports.

Ground Water in New York, February to July 2008

Ground-water levels for February and March 2008 were high throughout most of the State (normal-to-wet conditions) but began to decline in April through June as recharge from precipitation decreased. Most wells had recovered to normal or wet conditions by July as can be seen in figure 6 The NY WSC web page displays real-time and historic ground-water data for these and other wells, in addition to a monthly summary of hydrologic conditions. Another useful resource for hydrologic conditions in New York is the USGS ground-water watch page.

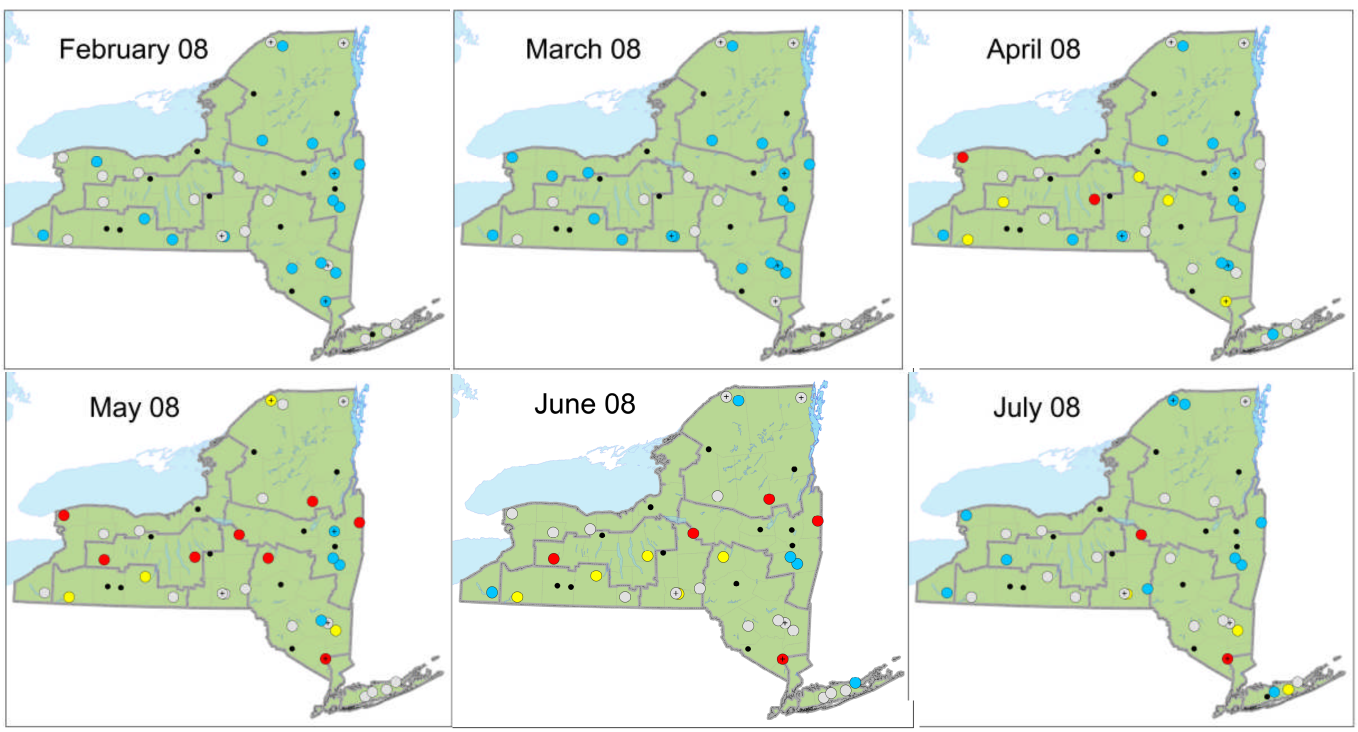

Figure 6. – Monthly hydrologic conditions in selected ground-water wells in New York from February to July, 2008. Blue dots indicate wet conditions, gray dots indicate normal conditions, yellow dots indicate dry conditions, red dots indicate very dry conditions, and small black dots are wells with insufficient years of record to characterize conditions or wells with missing data for the month.

Possible Loss of 21 gages – reduced flood and drought monitoring in the Southern Tier NY

Due to reductions in funding from partner agencies, the USGS may be forced to shut down 21 gages in the Susquehanna River basin in New York on October 1, 2008 (sites in the Chemung, Chenango, and Upper Susquehanna basins). A list of these sites can be viewed at http://waterdata.usgs.gov/ny/nwis/rt/. The sites are used by Federal, State, and local agencies to monitor streamflow conditions throughout the year. "The Susquehanna River basin is one of the Nation's most flood prone watersheds," according to the Susquehanna River Basin Commission. Data from these 21 sites provide critical information that the National Weather Service uses to model and forecast flood conditions and provide flood warnings. In addition, some of these sites are part of the New York drought monitoring network, used to monitor and define drought emergencies.

Users who can contribute funding for the non-Federal share of costs, to continue operation of these sites should contact Rafael Rodriguez at rrodrigu@usgs.gov.

New Reports from the New York Water Science Center

–Listed below are some of the reports written by scientists in the USGS New York WSC that were released in recent months. A complete list of New York WSC publications can by found on our publication search page.

Baldigo, B.P., Ernst, A.G., Schuler, G.E., and Apse, C.D., 2007, Relations of environmental factors with mussel-species richness in the Neversink River, New York: U.S. Geological Survey Open-File Report 2007–1283, 8 p.

Benotti, M.J., Abbene, Irene., and Terracciano, S.A., 2007, Nutrient Loading in Jamaica Bay, Long Island, New York: Predevelopment to 2005: U.S. Geological Survey Scientific Investigations Report 2007–5051, 17 p, online only.

Burns, D.A., Murray, K.R., Bode, R.W., and Passy, S., 2008, Changes in stream chemistry and biology in response to reduced levels of acid deposition during 1987-2003 in the Neversink River Basin, Catskill Mountains: Ecological Indicators, v. 8, issue 3, p. 191-203.

Burns, D.A., Blett, T., Haeuber, R., Pardo, L., 2008, Critical loads as a policy tool for protecting ecosystems from the effects of air pollutants: Frontiers in Ecology and the Environment, v. 6, Issue 3, p. 156-159.

Coon, W.F., and Reddy, J.E., 2008, Hydrologic and water-quality characterization and modeling of the Onondaga Lake basin, Onondaga County, New York: U.S. Geological Survey Scientific Investigations Report 2008–5013, 85 p.

Eckhardt, D.A. and Anderson, J.A., 2007, Geophysical logs of selected test wells at the Diaz Chemical Superfund Site in Holley, New York: U.S. Geological Survey Open-File Report 2007-1081, 15 p.

The USGS Water Resources Discipline (WRD) has the principal responsibility within the Federal Government to provide the hydrologic information and interpretation needed by others to achieve the best use and management of the Nation's water resources. WRD actively promotes the use of its information products by decision makers to:

Minimize loss of life and property as a result of water-related natural hazards, such as floods, droughts, and land movement.

Effectively manage ground-water and surface-water resources for domestic, agricultural, commercial, industrial, recreational, and ecological uses.

Protect and enhance water resources for human health, aquatic health, and environmental quality.

Contribute to wise physical and economic development of the Nation's resources for the benefit of present and future generations.

If you have an environmental or resource-management issue in which you would like to partner with the USGS to investigate, please contact any of our senior management staff (listed below). Projects are supported primarily through the Cooperative Water Program. This is a program through which any State, County, or local agency may work with the USGS to fund and conduct a monitoring or investigation project.

Elliott, E.M., Kendall, C., Wankel, S.D., Burns, D.A., Boyer, E.W., Harlin, K., Bain, D.J., and Butler, T.J., 2007, Nitrogen isotopes as indicators of Nox source contributions to atmospheric nitrate deposition across the Midwestern and Northeastern United States: Environmental Science and Technology, v. 41, no. 22, p. 7661-7667.

Ernst, A.G., Baldigo, B.P., Schuler, G.E., Apse, C.D., Carter, J.L., and Lester, G.T., 2008, Effects of habitat characteristics and water quality on macroinvertebrate communities along the Neversink River in southeastern New York, 1991–2001: U.S. Geological Survey Scientific Investigations Report 2008–5024, 15 p.

Homyak, P.M., Yanai, R.D., Burns, D.A., Briggs, R.D., Germain, R.H., 2008, Nitrogen immobilization by wood-chip application: Protecting water quality in a northern hardwood forest: Forest Ecology and Management, v. 225, no. 7, p. 2589-2601.

Kappel, W.M., Yager, R.M., 2008, Ground-water-flow modeling of a freshwater and brine-filled aquifer in the Onondaga Trough, Onondaga County, New York— A summary of findings: U.S. Geological Survey Open-File Report 2007-1409, 12 p.

Lovett, G.M., Burns, D.A., Driscoll, T.T., Jenkins, J.C., Mitchell, M.J., Rustad, L., Shanley, J.B., Likens, G.E., and Haeuber, R., 2007, Who needs environmental monitoring?: Frontiers in Ecology and the Environment, v. 5, no. 5, p. 253-260.

McHale, M.R., Burns, D.A., Lawrence, G.B. and Murdoch, P.S., 2007, Factors controlling soil water and stream water aluminum concentrations after a clearcut in a forested watershed with calcium-poor soils: Biogeochemistry, v. 84, no. 3, p. 311-331.

McHale, M.R., Murdoch, P.S., Burns, D.A., and Baldigo, B.P., 2008, Effects of forest harvesting on ecosystem health in the headwaters of the New York City water supply, Catskill Mountains, New York: U.S. Geological Survey Scientific Investigations Report 2008–5057, 22 p.

Miller, T.S., Bugliosi, E.F., Hetcher-Aguila, K.K., Eckhardt, D.A., 2007, Hydrogeology of two areas of the Tug Hill glacial-drift aquifer, Oswego County, New York: U.S. Geological Survey Scientific Investigations Report 2007–5169, 42 p, online only.

Murdoch, Peter S.; Jenkins, Jennifer C.; Birdsey, Richard A., 2008, The Delaware River Basin Collaborative Environmental Monitoring and Research Initiative – Foundation Document: Gen. Tech. Rep. NRS-25. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. Executive summary, 15 p.; online foundation document, 93 p.

Nystrom, E.A., Rehmann, C.R., and Oberg, K.A., 2007, Evaluation of mean velocity and turbulence measurements with ADCPs: Journal of Hydraulic Engineering, v. 133, no. 12, p. 1310-1318.

Nystrom, E.A., 2008, Ground-water quality in the Mohawk River Basin, New York, 2006: U.S. Geological Survey Open-File Report 2008-1086, 33 p., online only.

Stumm, Frederick, Chu, Anthony, Joesten, P.K. and Lane, J.W., Jr., 2007, Geohydrologic assessment of fractured crystalline bedrock on the southern part of Manhattan, New York, through the use of advanced borehole geophysical methods: Journal of Geophysics and Engineering, v. 4, no. 3, p. 245-252.

Wall, G.R., Nystrom, E.A., and Litten, S., 2008, Suspended sediment transport in the freshwater reach of the Hudson River Estuary in eastern New York: Estuaries and Coasts, v. 31, no. 3, p. 542-553.

Williams, J.H., 2008, Flow-log analysis for hydraulic characterization of selected test wells at the Indian Point Energy Center, Buchanan, New York: U.S. Geological Survey Open-File Report 2008–1123, 30 p., online only.

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